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# Forest Pest Management

## Pacific Southwest Region



October 23, 2000  
File Code: 3420

To: District Ranger, Truckee Ranger District, Tahoe National Forest  
Subject: Managing Dwarf Mistletoe Infested Areas In Recently Thinned Pine Stands (NE00-21)

### Introduction

On October 16, Karen Jones and I examined three pine stands that had been recently thinned in the All Over Timber Sale. These and other thinned stands in the area have openings created when groups of heavily dwarf mistletoe (DM) infested trees were harvested. In our review, we concluded that it will be necessary to sanitize the DM from the nearby infested overstory pine if the openings are regenerated with pine that is susceptible to DM.

### Discussion

Except for scattered white fir and lodgepole pine, the stands were stocked with Jeffrey pine (JP) and ponderosa pine (PP). The JP/PP in large areas in these and other thinned stands in the area are infested with western dwarf mistletoe, *Arceuthobium campylopodum* (DM)(see Appendix). The level of infestation in the diseased trees ranges from light to heavy (dwarf mistletoe ratings (DMR) of 1 to 6), with an estimated average of medium (DMR=3) for the DM centers and light (DMR<1) for the stands as a whole. Generally, the crowns in the DM centers appear healthy.

Scattered throughout this and other recent thinning projects in the area are one to three acre openings created when groups of heavily infested (DMR=5 or 6) JP/PP trees were removed in

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thinning operations. These openings are stocked mostly with JP/PP seedlings and saplings, many of which are infested with DM. Karen's preferred management for these openings is to remove the diseased seedlings and saplings, site prep the ground, and plant JP/PP seedlings. If this is done, the DM infested overstory JP/PP within 100 feet of the regenerated openings will need to be sanitized of all dwarf mistletoe infestations to keep the planted JP/PP seedlings from becoming infested.

DM seed is capable of spreading 60 to 100 feet (or more depending on the height of the DM plant, the wind, and the terrain) from DM plants in the crowns of mature JP/PP. If DM infested overstory trees are left within 100 feet of planted JP/PP, the seedlings will most likely become infested. The disease will slowly intensify in the understory as it spreads tree-to-tree and within the crowns of the young JP/PP until most of the planted trees in these small openings become heavily infested. Young JP/PP that are heavily infested with DM rarely grow to maturity.

Three management options available in this situation are no action; to plant non-host conifers in the openings; and to plant JP/PP in the openings and remove the DM from nearby overstory JP/PP. A brief discussion of each option follows.

### **Management Options**

**No Action** - The DM in the infested overstory JP/PP will slowly intensify over the remainder of the stand rotations. Heavily infested JP/PP will be stressed, especially during prolonged periods of below normal precipitation and may die or be killed by bark beetles. Most of the DM infested JP/PP seedlings/saplings in the openings will most likely be stunted and deformed and never grow to be merchantable trees. The stunted and deformed JP/PP in the understory, the DM brooms in the overstory trees, and the DM plants themselves can be beneficial to wildlife. White fir, lodgepole pine and incense cedar regeneration in the openings can grow to be merchantable trees if they are managed accordingly. Wood volume growth for the next 50 years should be reduced no more than 5 percent for the DM infected overstory trees. An additional loss of growth for the stand will result due to disease and understocking in the openings.

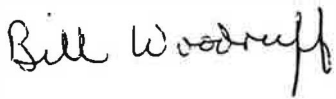
**Plant Non-Host Conifers in the Openings** - For this option, DM in the overstory will not be treated and the openings will be cleared and planted with seedlings that are not hosts for DM. Again, the DM in the infested overstory JP/PP will slowly intensify over the remainder of the stand rotations. Heavily infested JP/PP will be stressed, especially during prolonged periods of below normal precipitation and may die or be killed by bark beetles. DM brooms and the DM plants in the overstory trees can be beneficial to wildlife. Habitat in the regenerated openings will be different than in untreated openings and probably support a different mix of birds and mammals. Stocked openings will grow wood and contribute to the total volume production of each stand. The non-host trees [lodgepole pine (LP), incense cedar (IC), white fir (WF)] that would survive in these stands are economically less valuable than JP/PP. Establishing groups of non-host trees in the openings may not be a good alternative to establishing the JP/PP that currently dominate these stands. Wood volume growth for the next 50 years should be reduced no more than 5 percent due to the DM infected overstory JP/PP.

**Plant JP/PP in the Openings and Remove the DM from Nearby Overstory JP/PP** - For this option, DM infested branches will be removed from overstory JP/PP within 100 feet of the openings. This will require two prunings. The first will prune all the branches including one whorl above the last branch with visible evidence of DM (DM brooms, DM plants, branch swellings or remnants of DM plants). About five years later a second pruning will remove all the branches where DM plants grew from latent infections.

The openings will be cleared and planted with JP/PP seedlings. DM in the infested overstory JP/PP (trees further than 100 feet from the regenerated openings) will slowly intensify over the remainder of the stand rotations. Heavily infested JP/PP will be stressed, especially during prolonged periods of below normal precipitation and may die or be killed by bark beetles. DM brooms and the DM plants in the overstory trees can be beneficial to wildlife. Habitat in the regenerated openings will be different than in untreated openings and probably support a different mix of birds and mammals. Stocked openings will grow wood and contribute to the total volume production of each stand. The economic value of the JP/PP wood grown in the openings will be greater in the future than non-host (LP,IC,WF) wood. The value of the wood grown in the pruned overstory JP/PP should be more valuable in the future because of fewer knots in the manufactured lumber. The pruned JP/PP and the managed regenerated openings should be more resistant to fire damage since ladder fuels in the stands are reduced.

Karen and I discussed all of these options during our review of the area. We discussed the fact that there was insufficient revenue generated by past commercial thinning operations in these areas to fund DM suppression in addition to the required post-sale treatments. We discussed the fact that Forest Pest Management funding may be available for suppressing the dwarf mistletoe infestation in this area. We also discussed the process for requesting Forest Pest Management funds for DM suppression. If you are planning on submitting a project proposal for this year, we need the proposal by November 1<sup>st</sup>.

If you have any questions, please call me at 530-252-6680.



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## Appendix

### **Biology of Dwarf Mistletoe**

Dwarf mistletoes (*Arceuthobium* spp.) are parasitic, flowering plants that can only survive on living conifers in the Pinaceae. They obtain most of their nutrients and all of their water and minerals from their hosts. Western dwarf mistletoe (*A. campylopodum*) infects principally ponderosa and Jeffrey pines, and occasionally lodgepole pine.

Dwarf mistletoes spread by means of seed. In the fall the fruit ripen and the seeds are forcibly discharged from the aerial shoots. The seed is covered with a sticky substance and adheres to whatever it contacts. When a seed lands in a host tree crown, it usually sticks to a needle or twig, where it remains throughout the winter. The following spring the seed germinates and penetrates the twig at the base of the needle. For the next 2-4 years, the parasite grows within the host tissues, developing a root-like system within the inner bark and outer sapwood, and causing the twig or branch to swell. Aerial shoots then develop and bear seed in another 2-4 years.

Dispersal of dwarf mistletoe seeds is limited to the distance the seeds travel after being discharged. From overstory to understory, this is usually 20 to 60 feet, but wind may carry them as far as 100 feet from the source. A rule of thumb is that the seeds can travel a horizontal distance equal to the height of the highest plant in an infected tree. There is some evidence that long distance spread of dwarf mistletoe is occasionally vectored by birds and animals. Vertical spread within tree crowns of most dwarf mistletoes is limited to less than one foot per year because of foliage density.

Dwarf mistletoes are easy to identify because they are generally exposed to view within a tree's crown. Signs of infection include the yellow-green to orange mistletoe plants, basal cups on a branch or stem where the plants were attached, and detached plants on the ground beneath an infected tree. Symptoms include spindle-shaped branch swellings, witches' brooms in the lower crown, and bole swellings.

Western dwarf mistletoe is found on ponderosa and Jeffrey pine. This pathogen is present on pine of all sizes and ages. Where pine seedlings have established under infected overstory pine, the seedlings are often infected. Dwarf mistletoe infestations range from light to heavy. A six class dwarf mistletoe rating system (DMR) is used to rate the severity of infestation in a tree. A DMR of "1" indicates a light infestation with less than 1/6 of a crown infested. A DMR of "6" indicates that over 5/6 of a crown is infested. A DMR greater than 4 indicates a heavy infestation of dwarf mistletoe.

Heavy infestations kill branches, cause the development of witches brooms (tightly grown clump of vegetation on a branch), and severely weaken the pine. Weakened trees are usually killed when other agents (such as bark beetles, root diseases, or drought) occur. However, dwarf mistletoe is capable of killing pine seedlings and saplings, by itself, when the infections are

heavy. Light infestations have little effect on individual pine trees. However, light infestations will develop into heavy infestations in 40 or 50 years. It is estimated that the dwarf mistletoe will increase one DMR point in severity per decade. In addition, the disease spreads from tree to tree at various rates, depending on stand density and the position of the dwarf mistletoe plants in the crown.

It is thought that pine dwarf mistletoe in many forests has developed to its current level because of the suppression of natural wildfire over the past century. Since deadwood develops more rapidly in infested trees, they are more vulnerable to the effects of fire. Small, heavily infested pine are more likely to be killed by ground fire. Heavily infested branches near the ground on large trees are also likely to be killed by ground fire. When infection centers of heavily infested large pine over heavily infested regeneration occur, ground fires will flare up into the crowns of the overstory and consume the heavily infested center. It is in these ways that historic wildfire probably maintained a low level of dwarf mistletoe infestation in a landscape prior to European settlement.